



Oil Impregnated Paper Bushings

Trench High Voltage Products Ltd., Shenyang

72.5 kV to 1100 kV
up to 5000 A
IEC60137
GB/T4109

Group Bushing Facilities

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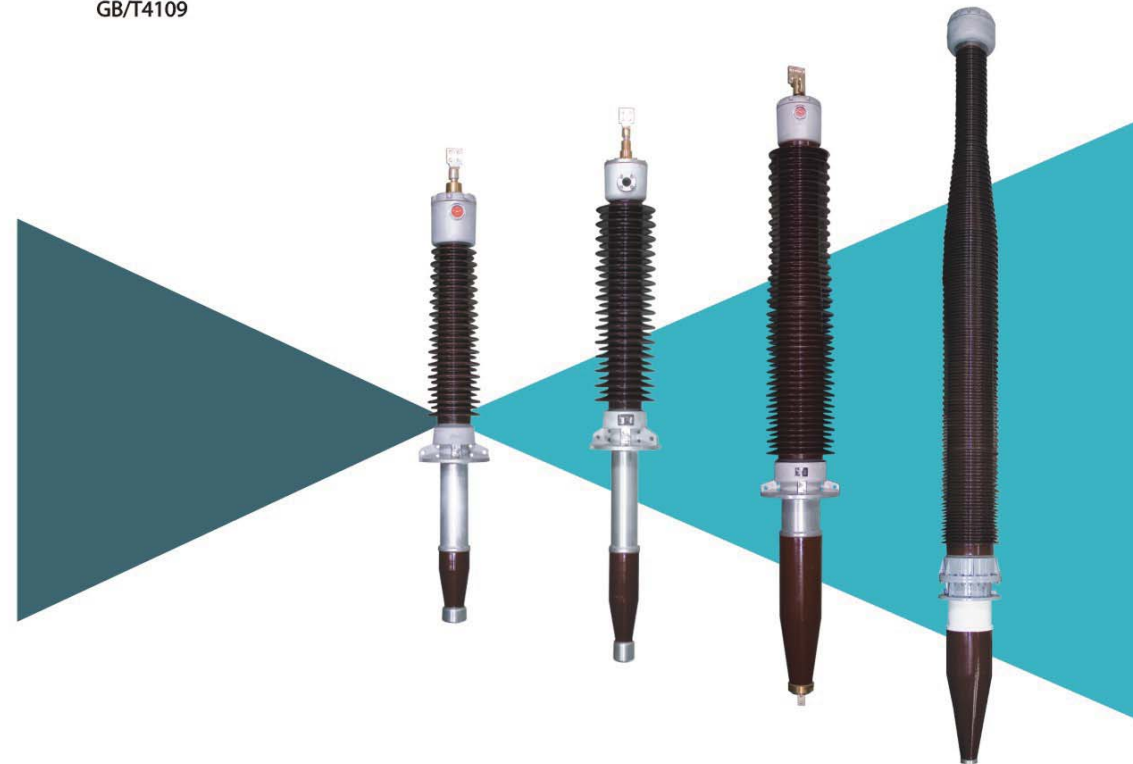
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Trench High Voltage Products Ltd., Shenyang (THVS) is a member of Trench group, a global leading manufacturer of HV transmission products. THVS uses the advanced design and processing techniques developed in Trench & Siemens and can supply 1100kV and below oil impregnated paper (OIP) and Epoxy resin impregnated paper (ERIP) bushings. Our products are designed and manufactured to IEC and ANSI where appropriate and world leaders in terms of quality and performance.

Facilities Include

- Products designed and manufactured to customer requirements.
- All bushings impulse tested as standard.
- Research and development and dielectric type testing to all national and international standards up to 3.2MV impulse, 1.5MV AC, 1.2MV DC in wet and dry conditions.
- Insulation studies and large-scale simulations.

Transformer Bushings

- Full range of designs for outdoor or indoor use.
- Oil and SF₆ connections.
- Insulation types include ERIP and OIP.
- OIP condenser bushings (type OTA) for medium/high power transformers.

Switchgear Bushings

- Epoxy resin impregnated paper condenser bushing for SF₆ insulated switchgear giving unrivaled mechanical and electrical performance up to 800kV.

Wall Bushings

- Total design and manufacture to customer requirements using epoxy resin.

Condenser Bushings for High Voltage Transformers

72.5kV to 1100kV up to 5,000A

Type OTA is a range of Oil Impregnated Paper condenser-type Transformer-to-Air bushings covering rated voltages from 72.5kV to 1100kV.

The bushings consist of a paper insulator wound onto a central tube or conductor, having aluminum foils inserted to give electrical stress grading through the insulation thickness and along its surface, producing an efficient, compact design.

The paper winding is enclosed within porcelain insulators at the outdoor and oil immersed ends and a central metallic housing which also provides the mounting flange. The wound core is impregnated with high-grade de-gassed mineral oil, following a carefully controlled heat and vacuum drying process.

Features

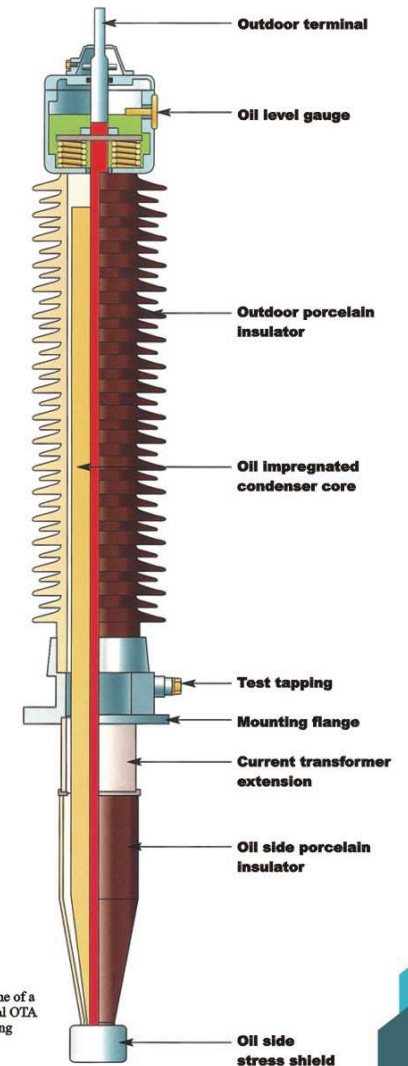
- Designed for transmission and distribution ratings in accordance with IEC 60137 and other international standards.
- Optimised construction to meet the latest Group II Classification For cantilever withstand load.
- Bushings may be installed up to 30° from vertical.
- Our proven reliability record with OIP condenser bushings guarantees extremely low partial discharge levels during transformer tests and partial discharge-free operation in service.
- Designs are provided to meet the most demanding pollution and heaving wetting conditions.
- Fixing flanges incorporate a test tapping for capacitance and tangent delta measurement.
- Transformer-end insulation is housed within a conical porcelain shell and terminated in an integral or detachable stress shield.
- Oil level indicators are provided on all bushings with magnetic indicators on bushings over 245kV.

Optional extras available on the voltage range 72.5kV to 245kV are:

- Current transformer accommodation extensions.
- Arcing horns.
- Special application outdoor porcelains.
- ANSI-type potential tapping.

Optional extras available on the voltage range 300kV to 1100kV are:

- As above, plus Air-end corona shield.



Type OTA Voltage Range 72.5kV to 245kV

Condenser bushings for
high voltage transformers

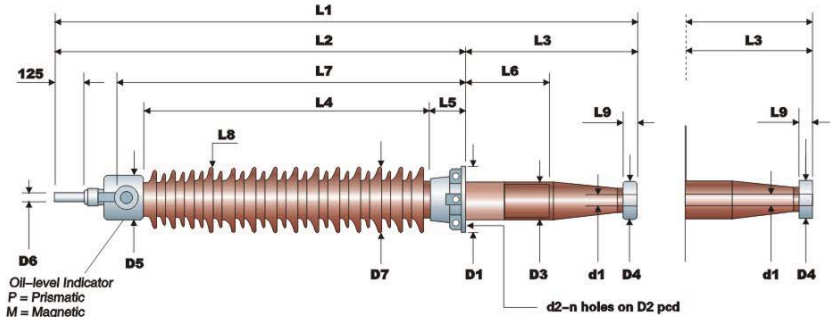


Figure 1b.

Figure 1a. Draw Lead Connection with Integral Stress Shield.

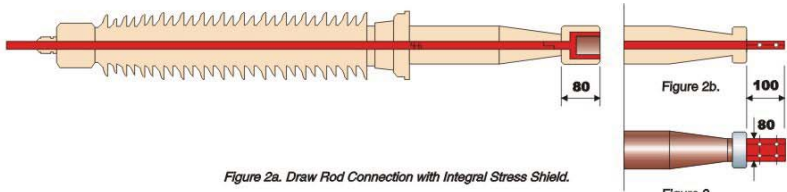
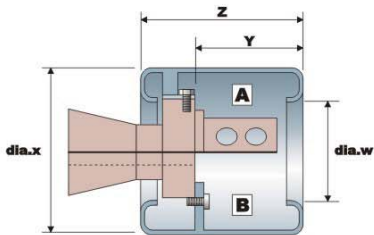


Figure 3.

Figure 2a. Draw Rod Connection with Integral Stress Shield.

Ur (kV)	Ir (A)	W	X	Y	Z	A	B
NOT REQUIRED FOR BUSHINGS WITH Fig. 1a & 2a CONNECTION ARRANGEMENTS							
72.5	1600						
123, 145	1250	120	170	150	205	B	
170, 245							
72.5	3150	170	220	170	230	A	
100							
123, 145	3150	185	260	170	230	A	
170, 245							
170	800	120	170	55	110	B	
245							

NYLON - COATED STRESS SHIELDS



Type OTA Voltage Range 72.5kV to 245kV

Condenser bushings for
high voltage transformers

REFERENCE		PERFORMANCE					DIMENSIONS																																														
RATED VOLTAGE (kV)		RATED CURRENT (A)		RATED PHASE TO EARTH VOLTAGE (kV)		MAX. POWER FREQUENCY WITHSTAND (kV)		LIGHTNING IMPULSE WITHSTAND (kVp)		CANTILEVER LOAD (kN)		TOTAL LENGTH		AIR-END LENGTH		OIL-END LENGTH		STRING LENGTH		FLANGE LENGTH		MINIMUM EARTH BAND		LENGTH OF DRAWLEAD CONNECTOR		CREEPAGE DISTANCE (PROTECTED=9, UN-PROTECTED=42.9)		TERMINAL LENGTH		FLANGE DIAMETER		FLANGE PITCH CIRCLE DIAMETER		MAXIMUM DIAMETER OF OIL-END		TERMINAL DIAMETER		CONSERVATOR DIAMETER		STEM DIAMETER		PORCELAIN DIAMETER		BORE OF TUBE		DIAMETER OF FLANGE BOLT HOLE		NUMBER OF BOLT HOLES		OIL-LEVEL INDICATOR		CONNECTION ARRANGEMENT	
Ur	Ir	Uy	Up	Ui	F	L	L1	L2	L3	L4	L5	L6	L7	L8	L9	D0	D1	D2	D3	D4	D5	D6	D7	d1	d2	n	P/M	Fig																									
72.5	630	42	147	325	2	1955	1268	687	700	185	400	1053	2010	60	330	280	136	120	240	30	288	35	18	6	P	1a																											
	1250					2102	1298	804	700	195	400	1080	2010	110	400	350	166	145	240	40	313	60	24	8	P	1a																											
	1600					2102	1298	804	700	195	400	1080	2010	110	400	330	280	166	145	240	40	313	60	18	6	P	1a																										
	2000				3.15	1985	1245	720	690	205	300	*	2250	40	335	290	162	*	240	60	349	*	22	8	P	2b																											
	2500					2185	1245	920	690	205	500		2010	40	335	290	162		240	60	313		22	8	P	2b																											
	3150				4	2165	1245	920	690	205	500		2010	40	335	290	162		240	60	313		22	8	P	3																											
	4000					2149	1245	904	700	195	400		2010	40	400	350	166		240	60	313		24	6	P	3																											
	5000					2803	1463	1140	700	235	500		2010	55	550	500	287		323	90	419		24	12	M																												
	123	630	71	230	550	3.15	2550	1740	810	1152	205	400	1525	3390	60	400	350	173	120	240	30	314	35	24	6	P	1a																										
		1250					2610	1770	840	1152	215	400	1535	3390	90	450	400	205	155	240	40	340	60	24	8	P	1a																										
1600						2877	1717	1160	1152	215	560		3390	40	400	350	195	*	240	60	340	*	24	6	P	2b																											
2000					4	2737	1717	1020	1152	215	500		3906	40	400	350	195		240	60	370		24	6	P	2b																											
2500						2828	1668	1160	1152	215	560		3390	40	400	350	195		240	60	340		24	6	P	2b																											
3150						2877	1717	1160	1152	215	560		3390	40	400	350	195		240	60	340		24	6	P	3																											
4000						2737	1717	1020	1152	215	500		3390	40	400	350	205		240	60	340		24	6	P	3																											
5000						2865	1825	840	1062	235	100		3150	55	550	500	270		323	90	419		24	12	M																												
145		630	84	275	650	3.15	2568	1848	720	1235	205	300	1585	3780	40	400	350	173	150	240	30	325	35	24	6	P	1b																										
		800					2763	1828	935	1235	205	550	1585	3780	40	400	350	173	150	240	30	325	35	24	6	P	1b																										
	1250					3135	1970	1165	1235	215	565	1700	3790	110	400	350	205	150	290	40	346	60	24	6	M	1a																											
	1600					3085	1910	1175	1235	215	600	*	3790	40	400	350	195	*	325	60	350	*	22	8	M	2b																											
	2500				4	3095	1910	1185	1235	215	600		3790	50	400	350	195		325	60	350		22	8	M	3																											
	4000					2828	1910	916	1235	215	100		3790	50	450	400	240		325	60	380		22	12	M	3																											
	170	630	98	325	750		2935	2110	825	1487	215	330	1845	4565	40	400	350	194	115	220	30	346	40	24	6	P	1b																										
		800					3100	2225	875	1647	215	300	2005	4818	40	400	350	194	115	220	30	346	40	22	8	P	1b																										
		1600					3310	2155	1155	1467	220	500	*	5120	50	450	400	241	*	325	60	408	*	22	12	M	2b																										
		2000				5	4210	2845	1365	2142	235	550		6930	50	550	500	270		323	60	419		24	12	M	3																										
4000						3955	2465	1490	1742	235	550		4900	50	550	500	300		323	60	473		24	12	M	3																											
245		630	142	460	1050	4	4090	2870	1220	2142	235	550	2585	6930	40	550	500	287	140	323	30	438	60	24	12	M	1b																										
		1250					3970	2870	1100	2142	235	430	2650	6930	40	550	500	287	140	323	30	438	60	24	12	M	1b																										
		1600					4435	2870	1565	2142	235	340	*	8600	50	730	680	270	*	323	60	453	*	19	12	M	2b																										
		2000				5	4280	2845	1435	2142	235	550		8600	50	550	500	270		323	60	453		24	12	M	3																										
		2500					4210	2845	1365	2142	235	550		6930	50	550	500	270		323	60	438		24	12	M	3																										
	3150					4410	2845	1565	2142	235	750		6930	50	550	500	270		323	60	438		24	12	M	3																											
	4000					4355	2865	1490	2142	235	550		8600	50	550	500	300		323	60	473		24	12	M	3																											
	5000					4817	2977	1840	2222	235	600		6930	55	550	500	315		385	90	470		24	12	M																												

Type OTA Voltage Range 300kV to 1100kV

Condenser bushings for high voltage transformers

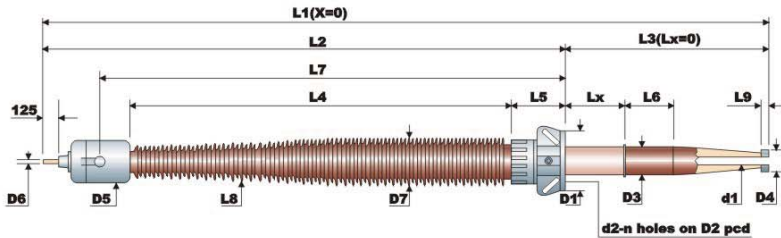


Figure 1. Draw Lead Connection

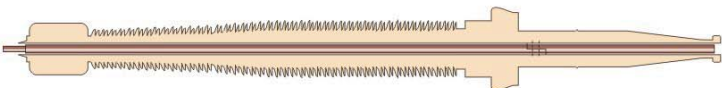


Figure 2. Draw Rod Connection

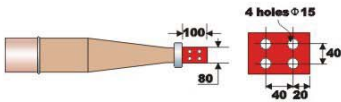
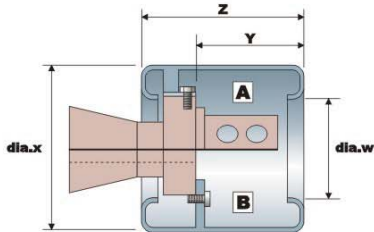


Figure 3. Direct Connection

Ur	Ir (A)	W	X	Y	Z	A	B
300	800	120	170	55	110	B	
300	1250 & 3150	185	250	170	230	A	
362	1600 & 3150						
362	1000	185	250	120	190	B	
420	1000 & 1600	210	290	130	190	B	
550							
420	1600 & 3150	210	290	230	290	A	
550							
800		150	350	270	370	A	

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A Screwed Fixing B Bolted Fixing

Type OTA Voltage Range 300kV to 1100kV

Condenser bushings for high voltage transformers

REFERENCE		PERFORMANCE						DIMENSIONS																			
RATED VOLTAGE (kV)		RATED CURRENT (A)	WET SWITCHING IMPULSE WITHSTAND (kV)	RATED PHASE TO EARTH VOLTAGE (kV)	MAX POWER FREQUENCY WITHSTAND (kV)	LIGHTNING IMPULSE WITHSTAND (kV)	CANTILEVER LOAD (kN)	TOTAL LENGTH	AIR-END LENGTH	OIL-END LENGTH	STRING LENGTH	FLANGE LENGTH	MINIMUM EARTH BAND	HEIGHT OF DRAW LEAD CONNECTOR	CREEPAGE DISTANCE (PROTECTED=0.42L,8)	TERMINAL LENGTH	FLANGE DIAMETER	FLANGE PITCH CIRCLE DIAM.	MAX DIAMETER OF OIL-END	TERMINAL DIAMETER	CONSERVATOR DIAMETER	STEM DIAMETER	PORCELAIN DIAMETER	BORE OF TUBE	DIAMETER OF FLANGE BOLT HOLE	NUMBER OF BOLT HOLES	CONNECTION ARRANGEMENT
Ur	Ir	Us	Uy	Up	UI	F		L1	L2	L3	L4	L5	L6	L7	L8	L9	D1	D2	D3	D4	D5	D6	D7	d1	d2	n	Fig
362	630	950	210	625	1175	5		6650	4830	1820	3720	430	600	4525	13013	40	710	660	350	170	500	60	470	60	24	12	1
	1250							6870	4830	1820	3720	430	600	4525	13013	40	710	660	350	170	500	60	470	60	24	12	1
	2500							6510	4800	1710	3720	430	600	*	13013	50	710	660	395	*	500	60	562	*	24	12	3
	3150							6620	4800	1820	3720	430	600		13013	50	710	660	395		500	60	562		24	12	3
420	1250	1050	242	695	1425			6480	4830	1650	3720	430	430	4510	13013	40	710	660	395	170	500	60	562	70	24	12	1
	1600							6585	4765	1820	3720	430	600	*	13013	50	710	660	345	*	500	60	470	*	24	12	
	4000							7170	5280	1890	4180	430	550		14755	55	710	660	395		500	90	562		24	12	
	5000							6920	5280	1640	4180	430	550		14755	55	710	660	395		500	90	562		24	12	
550	630	1175	318	740	1675			8097	6027	2070	4925	430	550	5730	19000	40	710	660	395	170	500	60	580	70	24	12	1
	1250							7747	5457	2290	4355	430	600	5160	15243	40	810	750	395	170	500	60	562	70	24	16	1
	1600							8144	6074	2070	4925	430	550	*	17380	40	710	660	395	170	500	60	562	70	24	12	
	2500							8550	6005	2545	4925	430	940		17380	50	710	660	395	*	500	60	562	*	24	12	3
800	800	1675	462	1020	2350			7200	5280	1940	4180	430	550		14755	55	710	680	478		500	90	650		24	12	3
	1250							10548	8360	2188	7108	500	550	*	24000	50	800	711	570	210	700	60	762		32	12	
	1600							10758	8360	2090	7108	500	570		27500	50	780	711	570		700	60	762		32	12	
	2500							10815	8577	1950	7325	500	600		27500	50	800	711	570		700	60	762		32	12	
1100	2000	1950	638	1200	2400			10815	8577	1950	7325	500	600		27500	50	800	711	570		700	60	762		32	12	
	2500							13625	11070	2230	9500	500	380		33000	50	1020	950	765	265	900	80	950		36	16	
								13270	10828	2562	9500	500	600		33000	50	1020	950	640	265	900	80	800		36	16	